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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/603,306	06/25/2003	Byoung Kwon Ahn	CU-3271 RJS	5269
26530	7590	09/13/2004	EXAMINER	
LADAS & PARRY LLP 224 SOUTH MICHIGAN AVENUE SUITE 1200 CHICAGO, IL 60604			PHAM, THANHHA S	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 09/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/603,306	<b>Applicant(s)</b> AHN ET AL.	
	<b>Examiner</b> Thanhha Pham	<b>Art Unit</b> 2813	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 January 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>08/11/03, 01/22/04</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Objections*

1. Claims 4, 5, 7-8, and 10 are objected to because of informalities. Appropriate correction would be made to clarify the scope of the claim:

➤ With respect to claim 4,

line 4-5, "the source and reaction gases" should be changed to "the Ta(OC<sub>2</sub>H<sub>5</sub>)<sub>5</sub> source and H<sub>2</sub>O reaction gases"

➤ With respect to claim 5,

line 2, "the source gas" should be changed to "the Ta(OC<sub>2</sub>H<sub>5</sub>)<sub>5</sub> source gas" (see claim 4 for details)

line 2, "the reaction gas" should be changed to "the H<sub>2</sub>O reaction gas" (see claim 4 for details)

➤ With respect to claim 7,

line 2, "the source gas" should be changed to "the yttrium source gas" (see claim 6 for details)

line 3, "the reaction gas" should be changed to "the H<sub>2</sub>O reaction gas" (see claim 6 for details)

➤ With respect to claim 8,

line 2, "the source gas" should be changed to "the yttrium source gas"

line 2, "the reaction gas" should be changed to "the H<sub>2</sub>O reaction gas"

➤ With respect to claim 10,

line 2, term “or “ should be changed to “and”

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**1. Claims 1-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

➤ With respect to claim 1,

lines 5-6, “forming a contact plug in contact with the substrate within the interlayer insulating film” renders the claim indefinite. It is not clear where “the substrate” comes from. How can “the substrate” be “within the interlayer insulating film”?

line 11, “Ta<sub>2</sub>O<sub>5</sub>(X)Y<sub>2</sub>O<sub>3</sub>(1-X)” renders the claim indefinite. The scope of the metes and boundary of scope of the claim is not clear. It is unclear what X represents and what value of X is. Can X be 1, 0 or infinitive?

➤ With respect to claim 2,

line 7, “the thin films” lacking antecedent basis renders the claim indefinite. It is not clear that “the thin films” means which films – Ta<sub>2</sub>O<sub>5</sub> thin films alone? Or Y<sub>2</sub>O<sub>3</sub> thin films alone? Or the alternatively deposited thin films?

line 11, “a single composite film” renders the claim indefinite. It is not clear that “a single composite film” is the same or different to “a single composite

Art Unit: 2813

film". Suggestion: "a single composite film" should be changed to "the single composite film" (see claim 1 for details)

➤ With respect to claim 12,

the scope of deposition ratio is not clear. Ratio "X:(1-X)" is unclear because it is not clear what X represents for – molecular fraction? Weight fraction? Thickness fraction? or anything?

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**2. Claims 1 and 16, as being best understood, are rejected under 35**

**U.S.C. 102(e) as being anticipated by Ahn et al [US 6,461,911].**

**\*\*\*Notice:** *This rejection is based on the scope of the claim that "a dielectric film composed of a single composite film of Ta<sub>2</sub>O<sub>5</sub> (single composite film Ta<sub>2</sub>O<sub>5</sub>(X)Y<sub>2</sub>O<sub>3</sub>(1-X) wherein X equals to 1)*

Ahn et al (figs 1-4 & 6-13 and col 1-12) discloses a method for forming a capacitor of a semiconductor device comprising the steps of:

Art Unit: 2813

forming an interlayer insulating film (142, fig 4, col 7 lines 22-30) on a semiconductor substrate (100) formed with a bit line (130);

forming a contact plug (144, fig 4, col 7 lines 31-37) in contact (electrically contact) with the semiconductor substrate (100), said contact plug being formed within the interlayer insulating film (142);

forming a storage electrode (162, fig 11, col 9 lines 40-42) on the interlayer insulating film (142) in such a manner that the storage electrode (162) comes in contact with the contact plug (144);

forming a dielectric film (164, fig 12, col 9 lines 57-60) composed of a single composite film of  $Ta_2O_5$ , single composite film  $Ta_2O_5(X)Y_2O_3(1-X)$  wherein  $X=1$ , on the storage electrode according to ALD (atomic layer deposition);

depositing a diffusion barrier film of TiN (lower portion of bi-layer 166, fig 12, col 10 lines 1-2) on the dielectric film (164); and

forming a plate electrode (upper portion of bi-layer 166 of polysilicon layer, fig 12, col 10 lines 1-2) on the diffusion barrier layer.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2813

**3. Claims 1 and 16, as being best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al [US 6,423,593] in view of Chang et al [US 2003/0031793].**

**Notice:** *This rejection is based on the scope of the claim that "a dielectric film composed of a single composite film of  $Ta_2O_5$  or  $Y_2O_3$  or combination of  $Ta_2O_5$  &  $Y_2O_3$ (single composite film  $Ta_2O_5(X)Y_2O_3(1-X)$  wherein  $1 \leq X \leq 0$ ).*

Yamamoto et al (figs 1-17 and col 1-12) discloses a method for forming a capacitor of a semiconductor device comprising the steps of:

forming an interlayer insulating film (17, fig 6, col 6 lines 27-30) on a semiconductor substrate formed with a bit line (BL);

forming a contact plug (22, fig 7, col 6 lines 49-50) in contact (electrically contact) with the semiconductor substrate, said contact plug being formed within the interlayer insulating film (17);

forming a storage electrode (30, fig 15, col 8-9) on the interlayer insulating film (17) in such a manner that the storage electrode (30) comes in contact with the contact plug (22);

forming a dielectric film (32, tantalum oxide, fig 16, col 9 lines 57-60) composed of a single composite film of  $Ta_2O_5$  or  $Y_2O_3$  or combination of  $Ta_2O_5$  &  $Y_2O_3$ ( tantalum oxide) on the storage electrode;

depositing a diffusion barrier film of TiN (col 9 lines 54-58) on the dielectric film;  
and

Art Unit: 2813

forming a plate electrode (33b, fig 17, col 9 lines 49-58) on the diffusion barrier layer (TiN).

Yamamoto et al does not expressly teach using ALD technology to form the single composite film of  $Ta_2O_5$  or  $Y_2O_3$  or combination of  $Ta_2O_5$  &  $Y_2O_3$ .

However, Chang et al (abstract, text paragraph [0012], [0038]-[0041]) discloses that using ALD technology to form the single composite film of  $Ta_2O_5$  or  $Y_2O_3$  or combination of  $Ta_2O_5$  &  $Y_2O_3$  would provide an improved high k dielectric film with less defects, reduced leakage current, higher throughput and better uniformity.

Therefore, at the time of invention, it would have been obvious for those skilled in the art to modify process of Yamamoto et al to using ALD technology to form the dielectric film composed of the composite film as being claimed, per taught by Chang et al, to form a better capacitor in the semiconductor device with reasons given above.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696. The examiner can normally be reached on Monday and Thursday 9:00AM - 9:30PM.

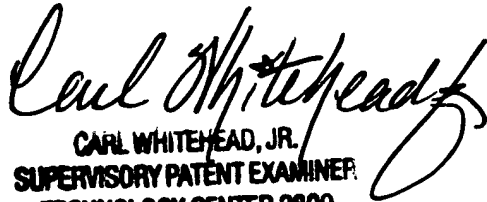
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



Art Unit: 2813

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thanhha Pham

  
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